

CLAIMS

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 1) ~~A pipe for great water depths allowing transfer of a fluid between a floating support (1) and a point located below and at a distance from the water surface, characterized in that it comprises :~~

- 5 ⇒ at least one flexible part (7) connected, at one end, to the point located below the surface, and
- ⇒ at least one rigid part (6) connected to the flexible part at one end and to the floating support at the second end thereof,
- ⇒ ~~said rigid part (6) having a length at least equal to half the water depth D.~~

10 2) ~~A pipe as claimed in claim 1, characterized in that :~~

⇒ the flexible part is defined as follows :

- a) establishing the extreme motions of the floating support,
- b) assuming that the motions at the top of the flexible part are substantially identical to the extreme motions,
- 15 c) selecting position P_h of the upper end of this flexible part on the vertical axis closer to the water layer bottom than to the surface and dimensioning the flexible part so as to take up at least the pre-established motions by taking account of at least the following parameters : inside pressure P_{int} , outside pressure P_{ext} , nature of the fluid, maximum strains such as maximum traction T_{max} undergone by the flexible
- 20 part, value of the maximum allowable curvature $c_{ourbmax}$,

if the flexible part does not meet the conditions of use, at least position P_h is changed,

⇒ ~~the rigid part is defined for given holding means and for a diameter value D_r ,~~

e) selecting its length L_r substantially equal to the value of the distance, under equilibrium conditions, between the upper end of the flexible riser and the holding means, so that L_r is at least equal to half the depth D of the water layer,

5 defining the value of the thickness thereof e_r so as to take up stresses generated by at least : the pipe weight, the suspended weight of the flexible part, the hydrodynamic strains, the strains induced by displacements of the floating support, the inside and outside pressures,

10 f) checking that the rigid part of the riser placed inside or on the edges of the floating support does not come into contact with a part of the floating support, and possibly starting again from stage b).

3) A pipe as claimed in claim 2, characterized in that the stages of dimensioning of the flexible part and of the rigid part are carried out under static conditions.

15 4) A pipe as claimed in claim 3, characterized in that static dimensioning is checked by means of dynamic dimensioning stages.

5) A pipe as claimed in claim 2, characterized in that the stages of dimensioning of ~~the flexible part and of the rigid part are carried out under dynamic conditions.~~

claim 1
6) A pipe as claimed in ~~any one of claims 1 to 5~~, comprising heat insulation means placed on at least the rigid part and/or the flexible part.

claim 1
20 7) A pipe as claimed in ~~any one of claims 1 to 6~~, characterized in that said rigid part is held up to the floating support by holding means (9) allowing said pipe to be tensioned under the effect of its own weight.

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claim 1
 8) A production riser or riser pipe as claimed in ~~any one of claims 1 to 7~~ for effluent transfer from a production well to a floating support.

claim 1
 9) An injection pipe or line as claimed in ~~any one of claims 1 to 7~~, characterized in that the rigid part is connected to a source of fluid to be injected and the flexible part is connected to a point where the fluid is to be injected.

10) A system for producing petroleum effluents in great water depths allowing fluid transfer between a floating support and a source of effluents, characterized in that it comprises at least one or more risers and/or one or more injection lines as claimed in *claim 1* ~~any one of claims 1 to 8~~.

claim 10
 11) A system as claimed in claim 10, comprising a catenary anchor system (10) applied to the rigid riser in the vicinity of the junction and/or of connector (8) between flexible part (7) and rigid part (6).

claim 10
 12) A production system as claimed in ~~any one of claims 10 et 11~~, comprising additional means for tensioning the riser(s).

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